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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

<i>Customer No.:</i>	23643	}
<i>Group:</i>	3749	}
<i>Confirmation No.:</i>	3387	}
<i>Application No.:</i>	10/719,423	}
<i>Invention:</i>	METHOD OF MIXING HIGH TEMPERATURE GASES IN MINERAL PROCESSING KILNS	}
<i>Applicant:</i>	Eric R. Hansen et al.	}
<i>Filed:</i>	November 21, 2003	}
<i>Attorney</i> <i>Docket:</i>	204560-73806	}
<i>Examiner:</i>	Jiping Lu	}

**DATED: SEPTEMBER 8, 2006**

**APPEAL BRIEF**

Mail Stop Appeal Brief-Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted electronically in support of the appeal from the Primary Examiner's February 8, 2006 final rejection of claims 1-29 and 31-34. This appeal brief is submitted within four months of the May 8, 2006 filing date of the Notice of Appeal. Appellants hereby petition the Commissioner for Patents to extend the time to file this Appeal Brief for two months

from July 8, 2006 to September 8, 2006. Appellants hereby authorize the Commissioner to charge the total amount of \$950.00 to cover the cost of the two-month extension (\$450.00) and the appeal filing fee (\$500.00) to Deposit Account No. 10-0435. Please charge any additional fees or credit any overpayments to Deposit Account No. 10-0435, with reference to our file number 204560-73806.

#### REAL PARTY IN INTEREST

The real parties in interest are Cadence Environmental Energy, Inc. and Ash Grove Cement Company, the assignees, pursuant to assignments recorded in the records of the U. S. Patent and Trademark Office at (1) reel 014493, beginning at frame 0720, (2) reel 014493, beginning at frame 0678, and (3) reel 014538, beginning at frame 0145..

#### RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants that will directly affect or be directly affected by, or have a bearing on the Board's decision in the present appeal.

#### STATUS OF CLAIMS

Claims 1-29 and 31-34 were finally rejected in the Office Action dated February 8, 2006.

Each of claims 1-29 and 31-34 is appealed.

A copy of pending claims 1-29 and 31-34 is attached hereto in an Appendix.

#### STATUS OF AMENDMENTS

Appellant filed a brief Reply in response to the February 8, 2006 final rejection for the sole purpose of filing a Terminal Disclaimer to overcome the obvious-type double patenting rejections. In response, the Examiner issued an Advisory Action on May 17, 2006 indicating that the double patenting rejections were overcome by the Terminal Disclaimer.

## SUMMARY OF CLAIMED SUBJECT MATTER

### Independent Claim 1:

Claim 1 is directed to a method of operating a mineral processing kiln (10) having an inclined rotary vessel (12). The method includes the step of introducing combustion air and combustible fuel in a sub-stoichiometric ratio through a lower end of the rotary vessel (12), and introducing additional combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel (12) and an upper end of the rotary vessel (12). The method of claim 1 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 1 on pages 14-15 of the specification also facilitates an understanding of claim 1.

### Independent Claim 7:

Claim 7 is directed to a method of operating a lime kiln (10) having an inclined rotary vessel (12). The method includes the steps of advancing lime mineral from an upper end of the inclined rotary vessel (12) to a lower end of the inclined rotary vessel (12), introducing combustion air and combustible fuel in a sub-stoichiometric ratio through the lower end of the rotary vessel (12), and introducing additional combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel and the upper end of the rotary vessel. The method of claim 7 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 1 on pages 14-15 of the specification also facilitates an understanding of claim 7.

### Independent Claim 14:

Claim 14 is directed to a method of controlling the air/fuel stoichiometry in a mineral processing kiln (10). The method includes the steps of advancing a combustible fuel into a lower end of a rotary vessel (12) of the mineral processing kiln (10), advancing a first quantity of combustion air into the lower end of the rotary vessel (12) to create sub-stoichiometric conditions in the lower end of the rotary vessel (12), and advancing a second quantity of combustion air into the rotary vessel (12), at a location between the lower end of the rotary vessel (12) and an upper end of the rotary vessel (12), to create super-stoichiometric conditions in a mid-portion of the rotary vessel (12). The method of claim 14 is shown diagrammatically, along with a stoichiometric illustration, in

FIG. 10b. Example 1 on pages 14-15 of the specification also facilitates an understanding of claim 14.

Independent Claim 19:

Claim 19 is directed to a method of operating a preheater/precalciner kiln (10) having an inclined rotary vessel (12). The method includes the steps of advancing mineral from a preheater/precalciner assembly (see, e.g., FIGS. 17-20 for exemplary preheater/precalciner assemblies) into an upper end of the inclined rotary vessel (12), advancing mineral from the upper end of the rotary vessel (12) to a lower end of the inclined rotary vessel (12), introducing a first quantity of combustion air and combustible fuel through the lower end of the rotary vessel (12), and introducing a second quantity of combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel (12) and the upper end of the rotary vessel (12). The method of claim 14 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 4 on pages 16-17 of the specification also facilitates an understanding of claim 19.

Independent Claim 26:

Claim 26 is directed to a mineral processing kiln (10) including an inclined rotary vessel (12) having a lower end and an upper end. The rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof (see FIG. 10b). A preheating/precalcining assembly (see, e.g., FIGS. 17-20 for exemplary preheater/precalciner assemblies) is positioned proximate to the upper end of the rotary vessel (12) such that mineral passes through the preheating/precalcining assembly prior to advancement into the rotary vessel (12). A stationary hood (28) is positioned proximate to the lower end of the rotary vessel (12), and a burner (24) is positioned proximate to the lower end of the rotary vessel (12). See FIGS. 10b and 17-20. Example 4 on pages 16-17 of the specification also facilitates an understanding of claim 26.

Independent Claim 26:

Claim 26 is directed to a lime kiln (10) including an inclined rotary vessel (12) having a lower end and an upper end. The rotary vessel has an air inlet opening defined therein at a location

between the upper end and the lower end thereof (see FIG. 10b). The lime kiln also has a mineral feed assembly operable to heat lime mineral and thereafter advance the lime mineral into the upper end of the rotary vessel (see FIGS. 17-20), a stationary hood (28) positioned proximate to the lower end of the rotary vessel (12), and a burner (24) positioned proximate to the lower end of the rotary vessel (12). See FIGS. 10b and 17-20. Examples 1 and 4 on pages 14-17 of the specification also facilitate an understanding of claim 31.

#### GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following six grounds of rejection are presented for review:

- (1) the rejection of claims 14 and 18 under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 3,488,700 issued to Iken et al. (hereinafter “Iken”);
- (2) the rejection of claims 19, 21, 23-28, and 31-33 under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 3,584,850 issued to Brandvold (hereinafter “Brandvold”);
- (3) the rejection of claims 1-13, 15-17, and 19-25 under 35 U.S.C. §103 as being obvious over Iken in view of Brandvold;
- (4) the rejection of claims 19, 21-28, and 31-33 under 35 U.S.C. §103 as being obvious over U.S. Patent No. 5,375,535 issued to Tutt (hereinafter “Tutt”) in view of U.S. Patent No. 4,329,180 issued to Herchenbach et al. (hereinafter “Herchenbach”);
- (5) the rejection of claims 1-18, 20, 22, 29, and 34 under 35 U.S.C. §103 as being obvious over Brandvold in view of U.S. Patent No. 3,584,850 issued to Baukel, Jr., et al (hereinafter “Baukal”); and
- (6) the rejection of claims 1-29 and 31-34 under 35 U.S.C. §103 as being obvious over Tutt in view of Baukel.

#### ARGUMENT

##### I. THE BOARD IS URGED TO REVERSE THE FIRST GROUND OF REJECTION

Claims 14 and 18 will be argued below as a single group.

A. Claims 14 and 18 are not Anticipated by Iken

Anticipation exists only if all the elements of the claimed invention are present in a product or process disclosed, expressly or inherently, in a single prior art reference. *Hazeline Corp. v. RCA Corp.*, 468 U.S. 1228 (1984). As will be discussed in detail below, Appellants assert that the §102 rejection of claims 14 and 18 based on Iken is improper and should be withdrawn for at least the following reasons:

- (i) there is no teaching in Iken of introducing a second quantity of combustion air into the rotary vessel at a location between the ends of the vessel, and
- (ii) there is no teaching in Iken of creating super-stoichiometric conditions in the mid-portion of the vessel.

(i) Air is not introduced at a location between the ends of the rotary vessel

Appealed claim 14 is as follows (with emphasis added):

14. A method of controlling the air/fuel stoichiometry in a mineral processing kiln, the method comprising the steps of:
  - advancing a combustible fuel into a lower end of a rotary vessel of the mineral processing kiln,
  - advancing a first quantity of combustion air into the lower end of the rotary vessel to create sub-stoichiometric conditions in the lower end of the rotary vessel, and
  - advancing a second quantity of combustion air into the rotary vessel, *at a location between the lower end of the rotary vessel and an upper end of the rotary vessel*, to create super-stoichiometric conditions in a mid-portion of the rotary vessel.

On page 2 of the 2/8/06 Office Action, the Examiner asserted:

Iken shows a method of operating a mineral process kiln 1 having inclined rotary kiln. Combustion air and fuel 4 is introduced at the lower end of rotary kiln (insufficient for complete combustion or at sub-stoichiometric combustion condition). Additional or enriched combustion air 5-7 is introduced (at 9) into the kiln (through the end wall not numbered between numerals 4 and 6), between the upper and lower ends of the kiln for complete combustion or excess air combustion or supper-stoichiometric [sic, super-stoichiometric] combustion same as the applicant's.

Respectfully, this is a misreading of the teachings of Iken. Indeed, a second quantity of combustion air is not introduced into the rotary kiln 1 of Iken *at a location between its lower end and its upper end*. Specifically, as shown in FIG. 1 of Iken, both the torch 4 and the air lance 5 extend through an outer wall in a stationary portion of the apparatus (i.e., the wall identified by the

Examiner as “the end wall not numbered between numerals 4 and 6”). Such a stationary portion of the apparatus (i.e., the portion of the apparatus shown in FIG. 1 as the unnumbered structure surrounding reference numerals 5, 6, and 7) is commonly known as a “hood”. From its position within the hood, but outside of the lower end of the rotary kiln 1, the tip of the torch 4 directs its flame 2 (including its associated combustion air) through the lower end of the rotary kiln 1. Likewise, from their position within the hood, but outside of the lower end of the rotary kiln 1, the nozzles 6, 7 of the air lance 5 direct their respective air streams 8, 9 through the lower end of the rotary kiln 1 (note that the rotary kiln 1 is not shown in the diagrammatic views of FIGS. 2-4 of Iken, with reference numeral 3 being used to designate the material being processed by the rotary kiln 1, not the kiln itself). *As such, all combustion air enters the rotary kiln 1 through its lower end, with no portion thereof entering the rotary kiln 1 at a location between the lower end of the rotary kiln and its upper end.*

In response to similar arguments made by Appellants in their response filed on November 15, 2005, the Examiner countered on pages 8-9 of the 2/8/06 Final Office Action:

... the applicant argued that the patent Iken (US Pat. 3488700) does not show the second quantity of combustion air 7, 9 introduced into the rotary kiln. The applicant further argued that the second quantity of combustion air 7, 9 was introduced from outside of the rotary kiln. The examiner disagrees with the applicant's because the additional quantity of combustion air 7 is introduced (at 9) into the kiln 1 (through the end wall of the rotary kiln 1, not numbered between numerals 4 and 6), between the upper and lower ends of the kiln for complete combustion or excess air combustion or super-stoichiometric [sic, super-stoichiometric] combustion same as applicant's. Moreover, the second quantity of combustion air does indeed make contact with the interior wall (at 3) of the rotary kiln between the upper and lower ends of the rotary kiln 1 (see the angle from [sic, formed] by air by air streams 7, 9).

Respectfully, the points raised by the Examiner in his response cannot be used to sustain his rejection. Firstly, Appellants did not argue that “the second quantity of air 7, 9 is not introduced into the rotary kiln”, but rather argued that a second quantity of combustion air is not introduced into the rotary kiln 1 of Iken *at a location between its lower end and its upper end*. Secondly, Appellants did not argue that “the second quantity of air 7, 9 is introduced from outside kiln”, but rather merely pointed out that, as shown in FIG. 1 of Iken, both nozzles 6 and 7 of the air lance 5 are located *outside* of the lower end of the rotary vessel 1 and hence introduce air into the lower end of the rotary kiln 1, *not at a location between its lower end and its upper end*. Thirdly, the Examiner argues that “the second quantity of combustion air does indeed make contact with the interior wall

(at 3) of the rotary kiln between the upper and lower ends of the rotary kiln 1.” Respectfully, it is unclear how this relates to the issues at hand, but even if true, simply because the air “makes contact with the wall” once its in the rotary kiln does not obviate the fact that such air is introduced through the lower end of the rotary vessel and ***not at a location between its lower end and its upper end.***

(ii) Super-stoichiometric conditions are not created in the mid-portion of the rotary vessel

As pointed out above, appealed claim 14 includes the following limitation (with emphasis added):

advancing a second quantity of combustion air into the rotary vessel, at a location between the lower end of the rotary vessel and an upper end of the rotary vessel, ***to create super-stoichiometric conditions in a mid-portion of the rotary vessel.***

As also noted above, on page 2 of the 2/8/06 Office Action, the Examiner asserted:

Additional or enriched combustion air 5-7 is introduced (at 9) into the kiln (through the end wall not numbered between numerals 4 and 6), between the upper and lower ends of the kiln for complete combustion or excess air combustion or ***super-stoichiometric [sic, super-stoichiometric] combustion same as the applicant's.***

Respectfully, this is a misreading of the teachings of Iken. Indeed, Iken does not disclose creating super-stoichiometric conditions in a mid-portion of its rotary kiln 1. Iken is silent as to the air/fuel ratio (or O/C ratio) of the final mixture. In other words, the addition of the second stream 9 only indicates that final mixture has become leaner. However, nowhere does Iken indicate that the final mixture has become super-stoichiometric. Perhaps introduction of the first stream 8 into the flame 2 creates an intermediate sub-stoichiometric mixture, with the subsequent introduction of the stream 9 creating a final mixture that is still sub-stoichiometric, albeit leaner. Perhaps the resultant final mixture is stoichiometric. Iken is silent on this point, and it cannot be speculated in the formation of a proper anticipation rejection.

In response to similar arguments made by Appellants in their response filed on November 15, 2005, the Examiner countered on page 9 of the 2/8/06 Final Office Action:

... the applicant also argued that the Iken patent '700 does not mention anything about combustion excessive air or deficient air supplies. The examiner also disagrees because the structure of the combustion air supplies 4-7 is capable of forming deficient combustion air (at 4) and excessive combustion air (at

5-7). Such excessive combustion air or air enriched supply 5-7 was clearly taught by Iken (see col.2, lines 60-72).

Respectfully, the points raised by the Examiner in his response cannot be used to sustain his rejection. Firstly, Appellants did not argue that Iken “does not mention anything about combustion excessive air or deficient air supplies”, but rather argued that Iken is silent as to the air/fuel ratio (or O/C ratio) of the final mixture (i.e., the final mixture of the fuel and air from the torch 4 and the supplemental supply from the lance 5). As a result of its silence, Iken cannot be construed to expressly disclose creating super-stoichiometric conditions in a mid-portion of its rotary kiln 1. Secondly, the section of Iken cited by the Examiner (i.e., column 2, lines 60-72) is devoid of any teaching that could be construed to teach creating super-stoichiometric conditions in a mid-portion of its rotary kiln 1. This section merely recites structure associated with the disclosed apparatus.

Not only does Iken not expressly teach such a limitation, the Examiner has not put forth a reasoned analysis as to how such a limitation is inherent to Iken. It seems that the Examiner attempted to do so when arguing “[t]he examiner also disagrees because the structure of the combustion air supplies 4-7 is capable of forming deficient combustion air (at 4) and excessive combustion air (at 5-7).” However, even if, for arguments sake, the apparatus of Iken is *capable* of creating super-stoichiometric conditions in the mid-portion of the kiln 1, it would not necessarily follow that such was inherent to the disclosure of Iken. “Inherency cannot be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *Hansgirg v. Kemmer*, 102 F.2d 212, 40 USPQ 665, 667 (CCPA 1939); *In re Oelrich and Divigard*, 666 F.2d 578, 212 USPQ 323, 326 (CCPA 1981). “Anticipation by inherency requires that 1) the missing descriptive matter be “necessarily present” in the prior art reference and that 2) it would be so recognized by persons of ordinary skill in the art.” *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1545, 1553 n.1 (Fed. Cir. 2001). In the present case, the Examiner has not established how creating super-stoichiometric conditions in the mid-portion of Iken’s rotary kiln 1 is “necessarily present”. In fact, its not even clear as to if the Examiner has raised the mere possibility or probability that such a step is inherent to Iken by merely speculating that the apparatus from the reference is “capable” of performing such a step. Either way, a legally sufficient inherency analysis has not been established for this missing limitation.

(iii) Conclusion regarding claims 14 and 18

Based on the above, the Examiner has not established a proper §102 rejection with regard to Appellant's claim 14. As such, the rejection of independent claim 14, and claim 18 depending therefrom, should be reversed.

II. THE BOARD IS URGED TO REVERSE THE SECOND GROUND OF REJECTION

The claims within the second ground of rejection will be separately argued in the following groups:

Group A – claims 19, 21, and 23-28

Group B – claims 31-33

A. Claims 19, 21, and 23-28 are not Anticipated by Brandvold

Brandvold discloses two distinctly different types of mineral kilns. FIGS. 1-4 are directed to a conventional long kiln in which the material being processed is introduced into the rotary vessel where it moves down the length of the kiln and is subjected to increasing kiln gas temperatures. In the upper portion of the rotary vessel where the kiln gas temperatures are the lowest, the mineral first undergoes a drying/preheating process and thereafter moves down the rotary vessel until the temperature is raised to calcining temperature. In this length of the rotary vessel, the mineral undergoes a calcining process (releasing carbon dioxide). The in-process mineral finally moves down the rotary vessel into an area where gas temperatures are the hottest, the clinkering or reaction zone at the fired lower end of the rotary vessel. In contrast, FIG. 5 of Brandvold is directed to a preheater/precalcining kiln. In a preheater/precalciner kiln, the raw mineral is heated to calcining temperatures in a stationary precalciner vessel before it drops into a heated rotary vessel for the higher temperature clinkering reactions.

As shown in FIGS. 1-4, Brandvold's conventional long kiln includes an air inlet opening 24e positioned between the ends of the rotary kiln 14, but no preheater/precalcining assembly. As shown in FIG. 5, Brandvold's preheater/precalcining kiln includes a preheater/precalciner assembly 38, but no air inlet opening positioned between the ends of the rotary vessel. As such, the issue relating to the rejection of claims 19, 21, and 23-8 effectively boils down to this: *the Examiner has not been able to point to kiln within Brandvold that includes both an air inlet opening positioned between the*

*ends of the rotary kiln and a preheater/precalciner assembly.* Instead, the Examiner has mischaracterized components of the Brandvold's long kiln as a "preheater/precalciner assembly" or, in the alternative, taken the air inlet opening 24e out of Brandvold's long kiln and placed it in Brandvold's preheater/precalciner kiln. Because of this, a proper rejection under §102 has not been established in regard to claims 19, 21, and 23-28 based on Brandvold for at least the following reasons:

- (i) the Examiner has adopted an overly broad, unreasonable interpretation of the claim term "preheater/precalciner assembly" when characterizing the components of Brandvold's conventional long kiln, and
- (ii) the Examiner was improperly picking and choosing between the two different types of kilns disclosed in Brandvold when formulating his rejection using the air inlet opening from Brandvold's long kiln and the preheater/precalcining assembly 38 of Brandvold's preheater/precalcining kiln.

(i) The Examiner has improperly interpreted the claim term "preheater/precalciner assembly".

Independent claims 19 and 26 are directed to mineral processing kilns which include, amongst other things, a rotary vessel having an opening located between its lower and upper ends and "a preheater/precalcining assembly." The Examiner has pointed to the tuyeres 24 of Brandvold's long kiln of FIGS. 1-4 as the claimed air inlet opening located between the ends of the rotary vessel, a characterization which Appellants concede. The Examiner has pointed to structures "38, 40, 20, 20b-20d" as the claimed "preheater/precalcining assembly". This list of structures is pulled from both Brandvold's long kiln (structures 20, 20b-20d) and Brandvold's preheater/precalciner kiln (structures 38, 40, 20d). Specifically, as shown in FIGS. 1-4, Brandvold discloses a conventional long kiln having "feeding means 20" which includes a weigh feeder 20b, chute 20c, and a feed tube 20d. As shown in FIG. 5, Brandvold discloses a preheater 38 which receives material from a hopper 40, where it is dried and partially preheated and thereafter introduced into the rotary kiln 14 via the feed tube 20d.

In the 2/8/2006 final Office Action, the Examiner indicated that the "feeding means 20" (i.e., the combination of the feeder 20b, chute 20c, and the feed tube 20d) read on the claimed "preheater/precalcining assembly" of Appellant's claims 19 and 26. While the broadest reasonable

interpretation standard does afford the Examiner a certain degree of latitude in formulating his rejection, Appellant submits that such a term of art (i.e., a preheating/precalcining assembly) is clearly distinct from the material feeder of Brandvold (i.e., feeding means 20). As noted in the first sentence of MPEP 2111, “during examination proceedings, claims are given their broadest reasonable interpretation consistent with the specification.” *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). This passage suggests that claims cannot be construed in a vacuum, but rather must be given an interpretation consistent with the specification. Other courts have also applied this standard:

*Since it would be unreasonable for the PTO to ignore any interpretive guidance afforded by the applicant's written description, either phrasing connotes the same notion: as an initial matter, the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art . . . . In re Morris*, 127 F.3d 1048, 1054-1055, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997) (emphasis added).

The decision (i.e. *Morris*) is also cited for guidance to patent examiners in MPEP 2111. The *Morris* decision further supports the notion that any “broad reasonable interpretation” proffered by an examiner must take into account terms “as they would be understood by one of ordinary skill in the art.” Neither the specification of the present application, nor its common usage in the art, would lead one skilled in the art to believe that the claimed “preheating/precalcininig assembly” means simply the material feeder disclosed in Brandvold. *In fact, the Examiner clearly acknowledges on the record on page 9, lines 15-18 of the 2/8/06 Final Office Action where he writes “[m]oreover, the term regarding “preheating/precalciner assembly” is well known in the art. The claimed “preheating/precalciner assembly” is nothing but a cyclone separator and a separate calciner connected in series as shown in the current application as FIGS. 17-20.”* In other words, the Examiner concedes that the disputed term is well known in the art, yet he continues to give it an interpretation that is overly broad. The Examiner bases his use of such an overly broad interpretation on the mistaken notion that he is allowed to do so since the Applicants can always amend their claims to includes features that the Examiner believes are part of such a well known assembly (see, e.g., page 9, lines 14-22 where the Examiner writes “[t]he examiner disagrees because the applicant always has the right to amend the claims to structurally define over the prior art references.” and “[t]he applicant is invited to add these structural features in the claims rather than rely on the broad claim language “preheating/precalcincg assembly.”) Respectfully, this sheds the spotlight on the real issue at hand – its not that the examiner is maintaining his rejection because

he disagrees with the fact that the term is well known in the art (in fact, he concedes that it is), ***but rather he is maintaining his rejection because he is applying the wrong legal standard.*** There is no legal standard, at least none offered by the Examiner, which allows an Examiner to ignore the guidelines spelled out in the MPEP and the judicial guidance provided by *Hyatt, Morris*, and the other holdings in this line of cases simply because the Examiner is of the belief that Applicant has “a right to amend his claims”.

In summary, the record clearly establishes that the Examiner has acknowledged that the term “preheating/precalcining assembly” has an art recognized meaning. The record also clearly establishes that despite his acknowledgement of the same, the Examiner refuses to apply the proper art recognized meaning of the term on the flawed belief that he can ignore such a meaning because the Applicant has the right to amend his claims. In doing so, the Examiner is maintaining a rejection that is inconsistent with both PTO procedures and the relevant case law. For this reason, the board is urged to reverse the rejection of claim 19 and 26.

(ii) The Examiner is improperly picking and choosing between Brandvold’s kilns.

When confronted with arguments similar to as made immediately above in section II A(i) relating to his use of an overly broad interpretation, the Examiner changed his characterization of Brandvold in the 6/15/05 Office Action and the 2/8/06 Final Office Action. In short, as described above, the Examiner had previously asserted that the “feeding means 20” of the conventional long kiln of FIGS. 1-4 of Brandvold could somehow be construed as a “preheating/precalcining assembly”. In response, Applicants argued that such an interpretation was improper since neither the specification of the present application, nor its common usage in the art, would lead one skilled in the art to believe that the term “preheating/precalcining assembly” means the “feeding means 20” of the long kiln of FIGS. 1-4 of Brandvold and the supposed indirect preheating of the mineral therein by the flue gas in the backhouse 22.

However, in the subsequent 6/15/06 Office Action and 2/8/06 Final Office Action, the Examiner began looking to the preheating/precalcining kiln of FIG. 5 of Brandvold where the Examiner calls out a “preheater or precalcining assembly 38, 40”. ***The problem is, the preheating/precalcining kiln of FIG. 5 of Brandvold does not have air inlet opening 24e, only the conventional long kiln of FIGS. 1-4 has such an opening. In other words, the Examiner is***

*picking and choosing between the long kiln and the preheating/precalcining kiln of Brandvold in an effort to find all of the elements necessary to support the Examiner's rejection.* In particular, the long kiln of FIGS. 1-4 doesn't include a "preheater or precalcining assembly 38, 40" (which is consistent with the Examiner's afore-described admission on the record that such a term is well known in the art to designate components that would not be found on a conventional long kiln). On the other hand, the preheating/precalcining kiln of FIG. 5 of Brandvold does not have an air inlet opening 24e positioned between the upper end and lower end of the rotary vessel – a point conceded by the Examiner in his Response to Arguments in the 2/6/06 Final Office Action on page 10, line 2 ("[h]owever, FIGS. 1 and 4 show such a conventional feature").

In other words, the record clearly establishes that the Examiner picks and chooses a "preheater/precalcining assembly" from Brandvold's preheating/precalcining kiln of FIG. 5 and an air inlet opening located between the ends of the rotary vessel from Brandvold's conventional long kiln of FIGS. 1-4. Such picking and choosing between the two different types of kilns is improper. "When a claimed invention is not identically disclosed in a reference, and instead requires picking and choosing among a number of different options disclosed by the reference, the reference does not anticipate." *Mendenhall v. Astec Industries, Inc.*, 13 U.S.P.Q.2d 1913, 1928 (Tenn. 1988), *aff'd* 13 U.S.P.Q.2d 1956 (Fed Cir. 1989).

In response to Applicants arguments citing authority for the impropriety of such picking and choosing, the Examiner again sustained the rejection on the legally flawed notion that he can ignore legal precedent since the Applicants can choose to amend their claims (see 2/8/06 Final Office Action page 10, lines 9-12 "[t]he applicant also argued that the examiner has improperly picked and chosen various elements from Brandvold patent against the broad claims presented. This line of argument is not persuasive because the applicant has absolute right to amend the broad claims in order to structurally define the prior art references.") Respectfully, this is a complete misapplication of the law. The Examiner has offered no legal basis for his assertion that he can ignore the teachings of *Mendenhall* simply because he is of the belief that the Applicants have a right to amend their claims.

In summary, the record clearly establishes that the Examiner has picked and chosen from the two different types of kilns disclosed in Brandvold in the formation of his rejection. The record also clearly establishes that despite his acknowledgement of the same, the Examiner refuses to apply the

proper legal standard established in *Mendenhall* under the flawed belief that he can ignore the Federal Circuit's guidance because the Applicant has the right to amend his claims. In doing so, the Examiner is maintaining a rejection that is completely contrary to relevant case law. For this reason, the board is urged to reverse the rejection of claim 19 and 26.

(iii) Conclusion regarding claims 19, 21, and 23-28

Based on the above, the Examiner has not established a proper §102 rejection with regard to Appellant's claims 19, 21, and 23-28. As such, the rejection of independent claims 19 and 23, and claims 21 and 24-28 depending either directly or indirectly therefrom, should be reversed.

B. Claims 31-33 are not Anticipated by Brandvold

On page 3 of the 2/8/06 Final Office Action, the Examiner asserted:

For claim 31, a mineral feed assembly 22a is operable to heat lime mineral and thereafter advance the lime mineral into the upper end of the rotary vessel 18. It is noted that the incoming mineral passes inlet chute 20d and is indirectly heated by the exiting hot flue gas 28 in vessel 22a.

The Examiner further noted in the Response to Arguments section of the same Office Action:

...regarding claims 31-33, the applicant argued that the examiner's rejection under Brandvold is not supported by the art. The examiner disagrees because the mineral feed assembly 22a, 20d is operable to heat incoming lime mineral by existing hot exhaust gases thru heat conduction and radiation.

Hence, by the Examiner's own admission, Brandvold does not disclose a feed assembly that is operable to "heat lime mineral *by contact with a kiln gas stream advancing therethrough*". To the contrary, by the Examiner's own admission, the long kiln of Brandvold is different since "mineral passes through the inlet chute 20d and is *indirectly heated* by the exiting hot flue gas 28 in vessel 22a" through "heat conduction" and "radiation". In other words, the lime mineral is NOT in contact with the kiln gas stream. As such, the rejection of claims 31-33 is not supported by the art and should be reversed.

III. THE BOARD IS URGED TO REVERSE THE THIRD GROUND OF REJECTION

The claims within the third ground of rejection will be separately argued in the following groups:

Group A – claims 1, 4-8, and 11-13

Group B – claims 2 and 9

Group C – claims 3 and 10

Group D – claim 15

Group E – claims 16 and 17

Group F – claims 19, 21, and 23-25

Group G – claim 20

Group H – claim 22

A. Claims 1, 4-8, and 11-13 are not Obvious over Iken and Brandvold

The §103 rejection of claims 1, 4-8, and 11-13 is improper and should be overruled for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The rule of law for a finding of obviousness under 35 U.S.C. § 103 was reiterated recently by the Court of Appeals for the Federal Circuit as follows, “[w]hen patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness.” *In re Lee*, 277 F.3d 1338 at 1343, 61 U.S.P.Q.2d 1430 (Fed. Cir. 2002); See also *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339 at 1351-52, 60 USPQ2d 1001 (Fed. Cir. 2001) (“the central question is whether there is reason to combine [the] references,” a question of fact drawing on the Graham factors). The Federal Circuit expounded upon the necessity of finding some teaching or motivation to combine the references *in the references themselves* concluding that “[t]he factual inquiry whether to combine references must be thorough and

searching.” *In re Lee*, 61 U.S.P.Q.2d at 1433 (Fed. Cir. 2002). The teaching or suggestion to make the claimed combination *must be found in the prior art*, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. “To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In this regard, the Examiner has not put forth a legally sufficient teaching, motivation, or suggestion in support of the proposed combination of Iken and Brandvold. In particular, the Federal Circuit has long since maintained a necessity of finding some teaching or motivation to combine the references *in the prior art*, such as the references themselves, and not based on applicant’s disclosure. The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done.

In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated in the 2/8/06 Final Office Action that it would have been obvious to modify “the rotary kiln 1 of Iken with a secondary combustion air or excessive combustion air supply on the wall of the kiln 1 between two kiln ends as taught by Brandvold *in order to provide a more direct supply of excessive combustion air*” (see page 4). He modified the purported motivation slightly in the Response to Arguments section where he writes *in order to provide a more direct supply of excessive combustion air for a complete combustion*” (see page 4). However, this conclusory statement is completely devoid of any legally sufficient teaching, motivation, or suggestion to combine the teachings of Iken and Brandvold in such a manner. Such an unsupported, conclusory statement offered by the Examiner is not a legally sufficient substitution for the factual analysis required by the Federal Circuit. The Examiner has failed to point to any section of Iken, Brandvold, or any other art of record wherein such teaching, motivation, or suggestion is provided.

Furthermore, not only has the Examiner not offered a legally sufficient teaching, motivation, or suggestion to combine the mineral kilns of Iken and Brandvold, it is believed that no such motivation exists. First of all, even if, for arguments sake, one of ordinary skill in the art had the

general desire to “provide a more direct supply of excessive combustion air for a complete combustion” to Iken’s kiln, the Examiner has failed to point to any teaching, motivation, or suggestion as to how such a general desire would lead to the specific combination of the air system of Brandvold with Iken’s kiln. In fact, Iken teaches that “in the inventive process the flame can be formed in an advantageous manner entirely as desired. By variation of the amount of oxygen in the individual nozzles, by changing the oxygen blowing angle to the bulk material, and the oxygen discharge speed, the flame can be controlled as desired.” (Iken, col. 2, lns. 24-29) No one armed with the general motivation to “provide a more direct supply of excessive combustion air for complete combustion” would go through the enormous time and expense of the extensive modifications that would be required to the kiln designs of Iken to equip them with the complex air introduction system 24 of Brandvold since the capability of forming any desired flame are already provided by the Iken system by use of much simpler means (e.g., “[b]y variation of the amount of oxygen in the individual nozzles, by changing the oxygen blowing angle to the bulk material, and the oxygen discharge speed”).

Furthermore, no one skilled in the art would modify the kiln of Iken to include the air introduction system 24 of Brandvold *since Brandvold's system is a cooling system*. Both the CCPA and the Federal Circuit have consistently held that when an obviousness rejection is based upon a combination or modification of a reference that destroys the intent, purpose, or function of the invention disclosed in the reference, such a proposed combination or modification is not proper and a *prima facie* case of obviousness cannot be made (see, e.g., *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)). In this case, Iken introduces secondary air into the kiln for the purposes of *heating* such air by contact with the hot mineral in the kiln (“...the now hotter and thus also more tenacious oxygen stream is well suited for flame formation...” see Iken col. 3, lns 4-20). As pointed out to the Examiner in a previous response, *cooling air* is admitted into the drying zone of the kiln of Brandvold through the tuyeres 24e (see, e.g., column 6, lines 64-75). *No one skilled in the art would introduce cooling air into the kiln of Iken to supplement the already present split secondary air supply since the very purpose of the existing secondary air supply of Iken is to heat the secondary air, not cool it.* To cool it would destroy its intended function.

Because the Examiner has offered only a conclusory, unsupported statement as the legally required teaching, motivation, and suggestion to combine Iken and Brandvold, and in light of the

overwhelming reasons against such a combination, it appears that the Examiner is using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction as a substitute for a factual basis for the rejection of the claims under 35 U.S.C. § 103. Such use of hindsight reconstruction is not proper. "There must be a reason apparent at the time the invention was made to a person of ordinary skill in the art for applying the teaching at hand, or the use of the teaching as evidence of obviousness will entail prohibited hindsight." *In re Nomiya, Kohisa, and Matsumura*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975). "The Patent Office has the initial duty of supplying a factually basis for a rejection under 35 U.S.C. § 103. It may not, because it may doubt that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis." *In re Rice*, 481 F.2d 1316, 178 USPQ 478, 479 (CCPA 1973).

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Iken and Brandvold, such a combination would not arrive at the invention of claims 1, 4-8, and 11-13. For example, as pointed out in regard to the §102 rejections over Iken, is silent as to the air/fuel ratio (or O/C ratio) of the resultant final mixture (i.e., the mixture after all of the streams have been introduced into the flame). In regard to claims 1 and 7, for example, it cannot be speculated that the air/fuel ratio (or O/C ratio) of the resultant final mixture is sub-stoichiometric. The resultant final mixture may be stoichiometric or it may be super-stoichiometric. Speculation is not proper in forming a rejection under § 103. The inclusion of Brandvold does not cure such deficiencies.

(iii) Conclusion regarding claims 1, 4-8, and 11-13.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellant's claims 1, 4-8, and 11-13. As such, the rejection of claims 1, 4-8, and 11-13 should be reversed.

**B. Claims 2 and 9 are not Obvious over Iken and Brandvold**

A proper rejection under §103 has not been established in regard to claims 2 and 9 since the Examiner has not shown where either Iken or Brandvold discloses creating super-stoichiometric conditions in the kiln. As discussed above, the Examiner has merely speculated that such conditions *could be* created. Speculation is not proper in forming a rejection under § 103. As such, the rejection of claims 2 and 9 should be reversed.

**C. Claims 3 and 10 are not Obvious over Iken and Brandvold**

A proper rejection under §103 has not been established in regard to claims 3 and 10 since the Examiner has not shown how the claimed ranges are mere matters of design choice. In particular, the Examiner bases his rejection on page 4 of the 2/8/06 Final Office Action on the notion that the claimed ranges are obvious “since applicant has not disclosed that the claimed combustion air mass flow rate range solves any stated problem in a new or unexpected way or is for any particular purpose which is unobvious to one of ordinary skill in the art.” Not only is the Examiner’s assertion a legally insufficient attempt to shift the burden of proving non-obviousness to the Applicant prior to first establishing a proper case of obvious, the Examiner is completely wrong on the state of the record of the subject prosecution. In fact, both Applicants’ specification and previous Responses to Office Actions have clearly established where the claimed ranges solve a stated problem in a new or unexpected way. Take for example Applicants response to the 6/3/04 Office Action which reiterates relevant sections of Appellants’s specification:

... at the time of Applicants' invention, it was commonly believed that injections of unheated air into the cement process downstream of the cooler and the resulting displacement of air from the cooler will result in unacceptable loss of heat recovery. On closer examination by Applicants, calculations revealed that such loss of heat recovery is minimal, especially in view of the benefits of mixing the process gases in high temperature zones. Calculations show that if 10% of the theoretical combustion air is introduced with high energy into the rotary kiln, the displacement of a corresponding mass of preheated air would result in a reduction of the heat recovery from the cooler of less than 2% of the total energy input. The potential gain in process efficiency due to elimination of stratification can more than offset this heat loss. Moreover, by use of such a mixing air substitution scheme, the primary combustion zone at the lower end of the rotary vessel can be operated at a sub-stoichiometric air-to-fuel ratio thereby creating an environment that favorably destroys NO<sub>x</sub> produced in the high temperature rotary kiln and pass through the precalciner/preheater.

In other words, the record clearly indicates that such ranges do, in fact, establish that such ranges are not mere design choices. The mere fact that the Examiner has heretofore chosen to ignore such portions of the record does not rebut their presence. Indeed, the Examiner has never rebutted the assertions made in the above-cited passage (or the corresponding portions of the specification) in an effort to cement his obvious rejection, but rather he has merely continued to insist that such passages don't exist in the record. As a result, the Examiner has failed to meet his burden of establishing a case of obviousness.

Because the Examiner has not established a prima facie case of obviousness in regard to Appellants' claims 3 and 10, the Board is urged to reverse the rejection.

D. Claim 15 is not Obvious over Iken and Brandvold

A proper rejection under §103 has not been established in regard to claim 15 since claim 15 is dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Applicants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

E. Claims 16 and 17 are not Obvious over Iken and Brandvold

A proper rejection under §103 has not been established in regard to claims 16 and 17 since claims 16 and 17 are dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claims 16 and 17 since the Examiner has not shown where either Iken or Brandvold discloses an air nozzle extending into the rotary vessel through an opening in the wall of the vessel with such a nozzle being used to create super-stoichiometric conditions in the mid-portion of the rotary vessel. As such, the rejection of claims 16 and 17 should be reversed.

F. Claims 19, 21, and 23-25 are not Obvious over Iken and Brandvold

The §103 rejection of claims 19, 21, and 23-25 is improper and should be reversed for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The arguments put forth above in section IIIA(i) relating to the lack of a legally sufficient teaching, motivation, or suggestion are relevant to the rejection of claims 19, 21, and 23-25 and are incorporated in their entirety into Appellants' argument relating to claims 19, 21, and 23-25.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Iken and Brandvold, such a combination would not arrive at the invention of claims 19, 21, and 23-25. For example, Iken does not disclose a preheater/precalcer assembly. Incorporating the air inlet opening 24e from Brandvold's long kiln, as proposed by the Examiner, would not cure such a deficiency.

(iii) Conclusion regarding claims 19, 21, and 23-25.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 19, 21, and 23-25. As such, the rejection of claims 19, 21, and 23-25 should be reversed.

G. Claim 20 is not Obvious over Iken and Brandvold

A proper rejection under §103 has not been established in regard to claim 20 since claim 20 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 20 since, as pointed out in regard to the §102 rejections over Iken, Iken is silent as to the air/fuel ratio (or O/C ratio) of the resultant final mixture (i.e., the mixture after all of the streams have been introduced

into the flame). In regard to claim 20, for example, it cannot be speculated that the air/fuel ratio (or O/C ratio) of the resultant final mixture is sub-stoichiometric. The resultant final mixture may be stoichiometric or it may be super-stoichiometric. Speculation is not proper in forming a rejection under §103. The inclusion of Brandvold does not cure such deficiencies. As such, the rejection of claim 20 should be reversed.

H. Claim 22 is not Obvious over Iken and Brandvold

A proper rejection under §103 has not been established in regard to claim 22 since claim 22 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 22 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

IV. THE BOARD IS URGED TO REVERSE THE FOURTH GROUND OF REJECTION

The claims within the fourth ground of rejection will be separately argued in the following groups:

Group A – claims 19, 21, 23-28, and 31-33

Group B – claim 22

A. Claims 19, 21, 23-28, and 31-33 are not Obvious over Tutt and Herchenbach

The §103 rejection of claims 19, 21, 23-28, and 31-33 is improper and should be reversed for at least the following reasons:

(i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The legal authorities put forth above in regard to the §103 rejections based on Iken and Brandvold are fully incorporated into this section.

In regard to the rejections based on the combination of Tutt and Herchenbach, the Examiner has not put forth a legally sufficient teaching, motivation, or suggestion in support of the proposed combination of Tutt and Herchenbach. In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated that it would have been obvious to modify the conventional long kiln of Tutt with the preheating/precalcining assembly of Herchenbach “in order to obtain a more efficient waste heat recovery” (see 2/8/06 Final Office Action on page 5). This conclusory statement is completely devoid of any legally sufficient teaching, motivation, or suggestion to combine the teachings of Tutt and Herchenbach in such a manner. Such an unsupported, conclusory statement is not a legally sufficient substitution for the factual analysis required by the Federal Circuit. The Examiner has failed to point to any section of Tutt, Herchenbach, or any other art of record wherein such teaching, motivation, or suggestion is provided.

Furthermore, not only has the Examiner not offered a legally sufficient teaching, motivation, or suggestion to combine the mineral kilns of Tutt and Herchenbach, it is believed that no such motivation exists. First of all, even if, for arguments sake, one of ordinary skill in the art had the general desire “to obtain a more efficient waste heat recovery” in regard to Tutt’s kiln, the Examiner has failed to point to any teaching, motivation, or suggestion as to how such a general desire would lead to the specific combination of adding the preheating/precalcining assembly of Herchenbach with Tutt’s conventional long kiln. This simply makes no sense. The combination is, in effect, a conventional long kiln with a preheater/precalciner assembly. Applicants argue that no one skilled in the art would make such a combination since the Tutt kiln has a fully functioning drying/preheat zone 24 and a calcining zone 26 *already built into the rotary vessel*. One skilled in the art would not go to the enormous effort and significant expense to install a preheating/precalcining system, such as the one proposed from Herchenbach, since to do so would create an expensive, redundant system. The system would be one in which the meal would be heated and calcined by the preheating/precalcining assembly, introduced into the rotary vessel where it would again be heated and then again calcined, and thereafter advanced into the clinker zone. One skilled in the art simply wouldn’t do this.

Furthermore, no one skilled in the art would modify the long kiln of Tutt to include a preheater or precalciner assembly *since the whole purpose of bypass systems, such as those taught in Tutt, is to allow operators of long kilns to be more economically competitive with operators of preheater/precalciner kilns.* (see Tutt, col. 2, ln. 42 through col. 3 line 12). In essence, the bypass system of Tutt is a retrofit to enhance the competitiveness of conventional long kilns versus preheater/precalciner kilns thereby allowing an operator to continue operating the conventional long kiln thereby avoiding the enormous cost of a replacement preheater/precalciner kiln. To install a preheating/precalcining assembly on the long kiln of Tutt, as proposed by the Examiner, would completely destroy the intent and purpose of the bypass system of Tutt. In other words, there would be no purpose to the bypass system of Tutt if the kiln was modified to add the very thing its use is trying to avoid – a preheating/precalcining assembly. When an obviousness rejection is based upon a combination or modification of a reference that destroys the intent, purpose, or function of the invention disclosed in the reference, such a proposed combination or modification is not proper and a *prima facie* case of obviousness cannot be made.

Because the Examiner has offered only a conclusory, unsupported statement as the legally required teaching, motivation, and suggestion to combine Tutt and Herchenbach, and in light of the overwhelming reasons against such a combination, it appears that the Examiner is using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction as a substitute for a factual basis for the rejection of the claims under 35 U.S.C. § 103. Such use of hindsight reconstruction is not proper.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Tutt and Herchenbach, such a combination would not arrive at the invention of claims 19, 21, 23-28, and 31-33. Firstly, the "air inlet opening" of Tutt identified by the Examiner (i.e., the undefined combination of elements 56-60) is a kiln bypass system which *withdraws* a portion of the kiln gas stream from the rotary vessel. The "air" supplied to such a system is the quench air that is used to cool the withdrawn kiln gas (see arrows 134 in FIG. 3). *Note that the quench air does not flow into the main body of the rotary vessel.* Such quench air could not be properly characterized as combustion air. Moreover, such an arrangement could not be

properly characterized as an “air inlet opening” of the rotary vessel since the air is not introduced into the rotary vessel, but rather only mixed with the kiln gas being withdrawn from the kiln.

(iii) Conclusion regarding claims 19, 21, 23-28, and 31-33.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants’ claims 19, 21, 23-28, and 31-33. As such, the rejection of claims 19, 21, 23-28, and 31-33 should be reversed.

B. Claim 22 is not Obvious over Tutt and Herchenbach

A proper rejection under §103 has not been established in regard to claim 22 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10 based on Iken and Brandvold, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

V. THE BOARD IS URGED TO REVERSE THE FIFTH GROUND OF REJECTION

The claims within the fifth ground of rejection will be separately argued in the following groups:

Group A – claims 1, 4-8, and 11-13

Group B – claims 2 and 9

Group C – claims 3 and 10

Group D – claims 14 and 16-18

Group E – claim 15

Group F – claim 20

Group G – claim 21

A. Claims 1, 4-8, and 11-13 are not Obvious over Brandvold and Baukel

The §103 rejection of claims 1, 4-8, and 11-13 is improper and should be overruled for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

**(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References**

The legal authorities put forth above in regard to the §103 rejections based on Iken and Brandvold and the the §103 rejections based on Tutt and Herchenbach are fully incorporated into this section.

In regard to the rejections based on the combination of Brandvold and Baukel, the Examiner has not put forth a legally sufficient teaching, motivation, or suggestion in support of the proposed combination of Brandvold and Baukel. In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated that it would have been obvious to “operate the kiln of Brandvold with the combustion rate at sub-stoichiometric ratio at the lower end and super-stoichiometric at the upper end as taught by Baukel *in order to obtain a complete combustion for clean air exhaust.*” Again, in lieu of a reasoned analysis that satisfies the legal relevant standards, the Examiner has merely floated out a conclusory statement that is completely devoid of any legally sufficient teaching, motivation, or suggestion to combine the teachings of Brandvold and Baukel in such a manner. Such an unsupported, conclusory statement is not a legally sufficient substitution for the factual analysis required by the Federal Circuit. The Examiner has failed to point to any section of Brandvold, Baukel, or any other art of record wherein such teaching, motivation, or suggestion is provided.

Furthermore, not only has the Examiner not offered a legally sufficient teaching, motivation, or suggestion to combine the teachings of Brandvold and Baukel, it is believed that no such motivation exists. First of all, even if, for arguments sake, one of ordinary skill in the art had the general desire “to obtain a complete combustion for clean air exhaust” in regard to Brandvold’s kiln, the Examiner has failed to point to any teaching, motivation, or suggestion as to how such a general desire would lead to the specific combination of the combustion process of Baukel with Brandvold’s kiln. This is true for a number of reasons. *Most importantly, as discussed in detail throughout Baukel, the combustion system of Baukel will not function in the kiln of Brandvold as purported*

*by the Examiner. Indeed, the secondary oxygen of Baukel must be introduced into the flame NOT at some location tens, if not hundreds, of feet away as proposed by the Examiner.* (see, e.g., Baukel at col. 4, lns 36-46 “*The location of oxygen introduction into the flame is critical*, and test furnace experiments later described showed that the *oxygen must be introduced directly into the visible flame* at a distance  $x$ , where  $x$  is measured from the burner discharge point in an axial direction, such that  $x/L$  is at least about 0.3,  $L$  being the total length of the visible flame produced by the burner as measured from the burner discharge point to the tip of the flame. The upper limit of  $x/L$  is about 0.8, beyond which  $\text{NO}_x$  formation begins to increase above that of conventional air-based burners.” Emphasis added.) As pointed out at col. 1, lns. 8-13 of Brandvold, the nominal size of a rotary kiln is **450 feet**, with the air inlet 24e being located on the other end of the kiln from the flame. In other words, air introduced through the air inlet 24e of Brandvold’s kiln is in no way being directed into the visible flame of the kiln’s burner. Baukel’s flame system will not function in such conditions. As such, no one skilled in the art would be motivated to make such a combination since it would simply wouldn’t work. To do so would destroy the whole intent, purpose, and function of the Baukel’s system. As established above, when an obviousness rejection is based upon a combination or modification of a reference that destroys the intent, purpose, or function of the invention disclosed in the reference, such a proposed combination or modification is not proper and a *prima facie* case of obviousness cannot be made.

Because the Examiner has offered only a conclusory, unsupported statement as the legally required teaching, motivation, and suggestion to combine Brandvold and Baukal, and in light of the overwhelming reason against such a combination, it appears that the Examiner is again using the Applicant’s application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction as a substitute for a factual basis for the rejection of the claims under 35 U.S.C. § 103. Such use of hindsight reconstruction is not proper.

(ii) **The Proposed Combination Does Not Arrive at the Invention.**

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Brandvold and Baukal, such a combination would not arrive at the invention of claims 1, 4-8, and 11-13. In the above arguments relating to both the §102 and the §103 rejections involving Brandvold, Appellants have traversed the rejections based on Brandvold

with a number of structural and process differences, with such distinctions not being repeated in this section for purposes of brevity. Baukel does not cure such deficiencies. Moreover, in the formation of the §103 rejection based on Brandvold and Baukel, the Examiner has again resorted to the improper picking and choosing from the different kilns disclosed in Brandvold. As a result of this, a *prima facie* case of obviousness has not been established in regard to claims 1, 4-8, and 11-13 since the combination does not arrive at the invention.

(iii) Conclusion regarding claims 1, 4-8, and 11-13.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 1, 4-8, and 11-13. As such, the rejection of claims 1, 4-8, and 11-13 should be reversed.

B. Claims 2 and 9 are not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claims 2 and 9 since the Examiner has not shown where either Brandvold or Baukel discloses creating super-stoichiometric conditions in the kiln. The Examiner has merely speculated that such conditions are present. Speculation is not proper in forming a rejection under § 103. As such, the rejection of claims 2 and 9 should be reversed.

C. Claims 3 and 10 are not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claims 3 and 10 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10 based on Iken and Brandvold, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claims 3 and 10 should be reversed.

D. Claims 14 and 16-18 are not Obvious over Brandvold and Baukel

The §103 rejection of claims 14 and 16-18 is improper and should be reversed for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The arguments put forth above in section VA(i) relating to the lack of a legally sufficient teaching, motivation, or suggestion are relevant to the rejection of claims 14 and 16-18 and are incorporated in their entirety into Appellants' argument relating to claims 14 and 16-18.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Brandvold and Baukel, such a combination would not arrive at the invention of claims 14 and 16-18. For example, neither Brandvold nor Baukel discloses creating sub-stoichiometric conditions in the lower end of the rotary vessel and super-stoichiometric conditions in the mid-portion of the vessel in the manner of claim 14. The Examiner has *speculated* as to what air-to-fuel ratios *could be* employed in the reference of Baukel, but has not pointed to any section of the reference where such ratios are actually disclosed. Such cannot be properly speculated in the formation of a proper rejection under §103.

(iii) Conclusion regarding claims 14 and 16-18.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 14 and 16-18. As such, the rejection of claims 14 and 16-18 should be reversed.

E. Claim 15 is not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Applicants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

F. Claim 20 is not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claim 20 since claim 20 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 20 since neither Brandvold nor Baukel discloses creating sub-stoichiometric in the manner of claim 20. The Examiner has *speculated* as to what air-to-fuel ratios *could be* employed in the reference of Baukel, but has not pointed to any section of the reference where such ratios are actually disclosed. Speculation is not proper in forming a rejection under §103. The inclusion of Brandvold does not cure such deficiencies. As such, the rejection of claim 20 should be reversed.

G. Claim 21 is not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claim 21 since claim 21 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established.

VI. THE BOARD IS URGED TO REVERSE THE SIXTH GROUND OF REJECTION

The claims within the sixth ground of rejection will be separately argued in the following groups:

- Group A – claims 1, 4-8, and 11-13
- Group B – claims 2 and 9
- Group C – claims 3 and 10
- Group D – claims 14 and 16-18
- Group E – claim 15
- Group F – claims 19, 21, and 23-28
- Group G – claims 20, 29
- Group H – claim 22
- Group I – claims 31-33
- Group J – claim 34

A. Claims 1, 4-8, and 11-13 are not Obvious over Tutt and Baukel

The §103 rejection of claims 1, 4-8, and 11-13 is improper and should be overruled for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The legal authorities put forth above in regard to the §103 rejections based on Iken and Brandvold and the the §103 rejections based on Tutt and Herchenbach are fully incorporated into this section.

In regard to the rejections based on the combination of Tutt and Baukel, the Examiner has not put forth a legally sufficient teaching, motivation, or suggestion in support of the proposed combination of Tutt and Baukal. In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated that it would have been obvious to “operate the kiln of Tutt with the combustion rate at sub-stoichiometric ratio at the lower end and super-stoichiometric at the upper end as taught by Baukal in order to obtain a complete combustion for clean air exhaust.” Once again, in lieu of a reasoned analysis that satisfies the legal relevant standards, the Examiner has merely offered up a conclusory statement that is completely devoid of any legally sufficient teaching, motivation, or suggestion to combine the teachings of Tutt and Baukel in such a manner. Such an unsupported, conclusory statement is not a legally sufficient substitution for the factual analysis required by the Federal Circuit. The Examiner has failed to point to any section of Tutt, Baukel, or any other art of record wherein such teaching, motivation, or suggestion is provided.

Furthermore, not only has the Examiner not offered a legally sufficient teaching, motivation, or suggestion to combine the teachings of Tutt and Baukel, it is believed that no such motivation exists since, like the combination of Brandvold and Baukel, the combustion system of Baukel simply will not function in the kiln of Tutt. *First of all, Tutt does not introduce air into the kiln at the purported “air inlet opening” (i.e., the undefined combination of elements 56-60), it withdraws kiln gas.* As such, there is no secondary air for use in the combustion system of Baukel, and

certainly no secondary air that is directed into the visible flame of Baukel. Baukel's flame system will not function in such conditions. As such, no one skilled in the art would be motivated to make such a combination since it would simply wouldn't work. To do so would destroy the whole intent, purpose, and function of the Baukel's system. As established above, when an obviousness rejection is based upon a combination or modification of a reference that destroys the intent, purpose, or function of the invention disclosed in the reference, such a proposed combination or modification is not proper and a *prima facie* case of obviousness cannot be made.

Because the Examiner has offered only a conclusory, unsupported statement as the legally required teaching, motivation, and suggestion to combine Tutt and Baukal, and in light of the overwhelming reason against such a combination, it appears that the Examiner is again using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction as a substitute for a factual basis for the rejection of the claims under 35 U.S.C. § 103. Such use of hindsight reconstruction is not proper.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Moreover, the proposed combination of Tutt and Baukel does not arrive at the invention as purported by the Examiner. Again, the "air inlet opening" identified by the Examiner (i.e., the undefined combination of elements 56-60) is a kiln bypass system which withdraws a portion of the kiln gas stream from the rotary vessel. The "air" supplied to such a system is the quench air that is used to cool the withdrawn kiln gas (see arrows 134 in FIG. 3). Note that the quench air does not flow into the main body of the rotary vessel. Such quench air could not be properly characterized as combustion air. Moreover, such an arrangement could not be properly characterized as an "air inlet opening" of the rotary vessel since the air is not introduced into the rotary vessel, but rather only mixed with the kiln gas being withdrawn from the kiln.

(iii) Conclusion regarding claims 14 and 16-18.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 14 and 16-18. As such, the rejection of claims 14 and 16-18 should be reversed.

B. Claims 2 and 9 are not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claims 2 and 9 since the Examiner has not shown where either Tutt or Baukel discloses creating super-stoichiometric conditions in the kiln. The Examiner has merely speculated that such conditions are present. Speculation is not proper in forming a rejection under § 103. As such, the rejection of claims 2 and 9 should be reversed.

C. Claims 3 and 10 are not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claims 3 and 10 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10 based on Iken and Brandvold, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claims 3 and 10 should be reversed.

D. Claims 14 and 16-18 are not Obvious over Tutt and Baukel

The §103 rejection of claims 14 and 16-18 is improper and should be reversed for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The arguments put forth above in section VIA(i) relating to the lack of a legally sufficient teaching, motivation, or suggestion are relevant to the rejection of claims 14 and 16-18 and are incorporated in their entirety into Appellants' argument relating to claims 14 and 16-18.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Tutt and Baukel, such a combination would not arrive at the invention of claims 14 and 16-18. For example, neither Tutt nor Baukel discloses creating sub-

stoichiometric conditions in the lower end of the rotary vessel and super-stoichiometric conditions in the mid-portion of the vessel in the manner of claim 14. The Examiner has *speculated* as to what air-to-fuel ratios *could be* employed in the reference of Baukel, but has not pointed to any section of the reference where such ratios are actually disclosed. Such cannot be properly speculated in the formation of a proper rejection under §103.

(iii) Conclusion regarding claims 14 and 16-18.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 14 and 16-18. As such, the rejection of claims 14 and 16-18 should be reversed.

E. Claim 15 is not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Applicants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

F. Claims 19, 21, and 23-28 are not Obvious over Tutt and Baukel

The §103 rejection of claims 19, 21, and 23-28 is improper and should be reversed for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The arguments put forth above in section VIA(i) relating to the lack of a legally sufficient teaching, motivation, or suggestion are relevant to the rejection of claims 19, 21, and 23-28 and are incorporated in their entirety into Appellants' argument relating to claims 19, 21, and 23-28.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Tutt and Baukel, such a combination would not arrive at the invention of claims 19, 21, and 23-28. For example, Tutt does no disclose “a preheater/precalciner assembly”. The Examiner admits this on the record in regard to the §103 rejections based on Tutt and Hechenbach (see page 5, first two lines of the 2/8/06 Final Office Action). In no way does Baukel cure this deficiency. As such, the combination does not arrive at the invention of claims 19, 21, and 23-28.

(iii) Conclusion regarding claims 19, 21, and 23-28.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants’ claims 19, 21, and 23-28. As such, the rejection of claims 19, 21, and 23-28 should be reversed.

G. Claims 20, 29 are not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claims 20 and 29 since claims 20 and 29 dependent on claim 19 and 26, respectively, and, as discussed herein, a proper rejection of claims 19 and 26 has not been established. Moreover, a proper rejection has not been established in regard to claims 20 and 26 since neither Tutt nor Baukel discloses creating sub-stoichiometric in the manner of claims 20 and 29. The Examiner has *speculated* as to what air-to-fuel ratios *could be* employed in the reference of Baukel, but has not pointed to any section of the reference where such ratios are actually disclosed. Speculation is not proper in forming a rejection under §103. The inclusion of Tutt does not cure such deficiencies. As such, the rejection of claims 20 and 29 should be reversed.

H. Claim 22 is not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claim 22 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record

why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

I. Claims 31-33 are not Obvious over Tutt and Baukel

The §103 rejection of claims 31-33 is improper and should be reversed for at least the following reasons:

- (i) there is no legally sufficient teaching, motivation, or suggestion to combine the references, and
- (ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Teaching, Motivation, or Suggestion to Combine the References

The arguments put forth above in section VIA(i) relating to the lack of a legally sufficient teaching, motivation, or suggestion are relevant to the rejection of claims 31-33 and are incorporated in their entirety into Appellants' argument relating to claims 31-33.

(ii) The Proposed Combination Does Not Arrive at the Invention.

Even if, for arguments sake, that the Examiner had offered a legally sufficient teaching, motivation, or suggestion to combine Tutt and Baukel, such a combination would not arrive at the invention of claims 31-33. For example, neither Tutt nor Baukel disclose a feed assembly that is operable to "heat lime mineral *by contact with a kiln gas stream advancing therethrough*". In other words, the lime mineral is NOT in contact with the kiln gas stream. As such, the combination does not arrive at the invention of claims 31-33.

(iii) Conclusion regarding claims 31-33.

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 31-33. As such, the rejection of claims 31-33 should be reversed.

H. Claim 34 is not Obvious over Tutt and Baukel

A proper rejection under §103 has not been established in regard to claim 34 since claim 34 is dependent on claim 31 and, as discussed herein, a proper rejection of claim 31 has not been

established. Moreover, a proper rejection has not been established in regard to claim 34 since neither Tutt nor Baukel discloses creating sub-stoichiometric in the manner of claim 34. The Examiner has *speculated* as to what air-to-fuel ratios *could be* employed in the reference of Baukel, but has not pointed to any section of the reference where such ratios are actually disclosed. Speculation is not proper in forming a rejection under §103. The inclusion of Tutt does not cure such deficiencies. As such, the rejection of claim 34 should be reversed.

## VII. SUMMARY CONCLUSIONS

Therefore, in view of the arguments presented above, it is submitted that each of the six grounds of rejection is erroneous. The Board is thus urged to reverse these rejections. Such action is respectfully requested.

Respectfully submitted,

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## CLAIMS APPENDIX

1. A method of operating a mineral processing kiln having an inclined rotary vessel, the method comprising the steps of:

introducing combustion air and combustible fuel in a sub-stoichiometric ratio through a lower end of the rotary vessel, and

introducing additional combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and an upper end of the rotary vessel.

2. The method of claim 1, wherein:

the amount of air introduced through the lower end of the vessel and the amount of air introduced through the opening in the vessel wall define a total combustion air,

the ratio of the total combustion air and the combustible fuel introduced through the lower end of the rotary vessel defines a total air/fuel ratio, and

the step of introducing additional combustion air comprises introducing an amount of combustion air sufficient to create a super-stoichiometric total air/fuel ratio.

3. The method of claim 1, wherein the step of introducing additional combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the mineral processing kiln.

4. The method of claim 1, wherein:

the mineral processing kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing additional combustion air comprises introducing additional combustion air through the air nozzle.

5. The method of claim 4, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing additional combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

6. The method of claim 1, wherein the step of introducing additional air comprises introducing combustion air into a reducing zone of the rotary vessel.

7. A method of operating a lime kiln having an inclined rotary vessel, the method comprising the steps of:

advancing lime mineral from an upper end of the inclined rotary vessel to a lower end of the inclined rotary vessel,

introducing combustion air and combustible fuel in a sub-stoichiometric ratio through the lower end of the rotary vessel, and

introducing additional combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and the upper end of the rotary vessel.

8. The method of claim 7, wherein:

the step of advancing lime mineral comprises advancing lime mineral through a calcining zone of the rotary vessel to liberate CO<sub>2</sub> from the lime mineral, and

the step of introducing additional combustion air comprises introducing additional air into the calcining zone of the rotary vessel.

9. The method of claim 7, wherein:

the amount of air introduced through the lower end of the vessel and the amount of air introduced through the opening in the vessel wall define a total combustion air,

the ratio of the total combustion air and the combustible fuel introduced through the lower end of the rotary vessel defines a total air/fuel ratio, and

the step of introducing additional combustion air comprises introducing an amount of combustion air sufficient to create a super-stoichiometric total air/fuel ratio.

10. The method of claim 7, wherein the step of introducing additional combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the lime kiln.

11. The method of claim 7, wherein:

the lime kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing additional combustion air comprises introducing additional combustion air through the air nozzle.

12. The method of claim 11, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing additional combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

13. The method of claim 7, wherein the step of introducing additional air comprises introducing combustion air into a calcining zone of the rotary vessel.

14. A method of controlling the air/fuel stoichiometry in a mineral processing kiln, the method comprising the steps of:

advancing a combustible fuel into a lower end of a rotary vessel of the mineral processing kiln,

advancing a first quantity of combustion air into the lower end of the rotary vessel to create sub-stoichiometric conditions in the lower end of the rotary vessel, and

advancing a second quantity of combustion air into the rotary vessel, at a location between the lower end of the rotary vessel and an upper end of the rotary vessel, to create super-stoichiometric conditions in a mid-portion of the rotary vessel.

15. The method of claim 14, wherein the step of advancing the second quantity of combustion air comprises advancing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the mineral processing kiln.

16. The method of claim 14, wherein:

the mineral processing kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of advancing the second quantity of combustion air comprises advancing additional combustion air through the air nozzle.

17. The method of claim 16, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of advancing the second quantity of combustion air further comprises advancing pressurized air from the pressurized air source through the nozzle.

18. The method of claim 14, wherein the step of advancing the second quantity of combustion air comprises advancing combustion air into a reducing zone of the rotary vessel.

19. A method of operating a preheater/precalciner kiln having an inclined rotary vessel, the method comprising the steps of:

advancing mineral from a preheater/precalciner assembly into an upper end of the inclined rotary vessel,

advancing mineral from the upper end of the rotary vessel to a lower end of the inclined rotary vessel,

introducing a first quantity of combustion air and combustible fuel through the lower end of the rotary vessel, and

introducing a second quantity of combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and the upper end of the rotary vessel.

20. The method of claim 19, wherein the first introducing step comprises introducing combustion air and combustible fuel in a sub-stoichiometric ratio.

21. The method of claim 19, wherein:

the step of advancing mineral comprises advancing mineral through a calcining zone of the rotary vessel to liberate CO<sub>2</sub> from the mineral, and

the step of introducing the second quantity of combustion air comprises introducing the second quantity of combustion air into the calcining zone of the rotary vessel.

22. The method of claim 19, wherein the step of introducing the second quantity of combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the preheater/precalciner kiln.

23. The method of claim 19, wherein:

the preheater/precalciner kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing the second quantity of combustion air comprises introducing additional combustion air through the air nozzle.

24. The method of claim 23, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing the second quantity of combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

25. The method of claim 19, wherein the step of introducing the second quantity of combustion air comprises introducing combustion air into a calcining zone of the rotary vessel.

26. A mineral processing kiln, comprising:

an inclined rotary vessel having a lower end and an upper end, the rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof,

a preheating/precalcining assembly positioned proximate to the upper end of the rotary vessel such that mineral passes through the preheating/precalcining assembly prior to advancement into the rotary vessel,

a stationary hood positioned proximate to the lower end of the rotary vessel, and

a burner positioned proximate to the lower end of the rotary vessel.

27. The mineral processing kiln of claim 26, further comprising an air nozzle extending into the rotary vessel through the air inlet opening of the wall of vessel.

28. The mineral processing kiln of claim 27, further comprising a pressurized air source coupled to the air nozzle.

29. The mineral processing kiln of claim 26, further comprising a primary combustion air source adapted to advance combustion air through the stationary hood, wherein the primary air source and the burner are operable to create sub-stoichiometric air/fuel conditions in the lower end of the rotary vessel.

31. A lime kiln, comprising:

an inclined rotary vessel having a lower end and an upper end, the rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof,

a mineral feed assembly operable to heat lime mineral and thereafter advance the lime mineral into the upper end of the rotary vessel,

a stationary hood positioned proximate to the lower end of the rotary vessel, and

a burner positioned proximate to the lower end of the rotary vessel.

32. The lime kiln of claim 31, further comprising an air nozzle extending into the rotary vessel through the air inlet opening of the wall of vessel.

33. The lime kiln of claim 32, further comprising a pressurized air source coupled to the air nozzle.

34. The lime kiln of claim 31, further comprising a primary combustion air source adapted to advance combustion air through the stationary hood, wherein the primary air source and the burner are operable to create sub-stoichiometric air/fuel conditions in the lower end of the rotary vessel.

### EVIDENCE APPENDIX

Nothing is included with this appendix.

**RELATED PROCEEDINGS APPENDIX**

Nothing is included with this appendix.